



Reshaping a farming culture through participatory extension: An institutional logics perspective

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ARTICLE INFO

Keywords:

Institutional logics
Institutional change
Bottom-up processes
Participatory extension
Discussion groups
Practice change

ABSTRACT

Historically the dominant farming culture in Western developed countries, such as Scotland and New Zealand, has been based on maximising food production and maintaining the family business. However, this culture of production and family is under pressure from societal calls to increase the uptake of environmental practices in farm management. The pressure is leading farmers to adopt environmental practices, which causes a clash with the beliefs and values underlying the culture of production and family business. This clash is problematic, as it might form a barrier to sustained environmental change, for which not only practice change is required, but also a change in beliefs and values guiding the farming culture. This study explores the clash using an institutional perspective to: i) analyse how farmer practices, beliefs and values change due to external pressure to adopt environmental practices; ii) identify mechanisms via which this change unfolds; and iii) understand the role of participatory extension programmes in this change. An institutional perspective enables this study to move beyond the role of individual's attitudes and behaviours in adoption of environmental practices, towards considering how farmers' practices, beliefs and values together constitute the culture of farming, and how these are shaped by societal and institutional mechanisms. Twenty Scottish and 52 New Zealand farmers participated in qualitative, open-ended interviews and were observed during discussion groups or advisory meetings. Our findings show that all farmers are guided by a 'business', 'lifestyle' and/or 'learning' logic. The institutional clash influenced practices underlying the business logic to change from being purely based on maximising productivity, to including environmental aspects. However, no change in values was observed. Participatory extension programmes influenced practices, beliefs and values underlying the learning logic (changing from a 'linear' to 'multi-actor' logic) and thus can help facilitate more effective practice change by providing support via micro-mechanisms and enabling dynamics. The study contributes to current literature by introducing a new lens for understanding change induced by participatory extension programmes and by providing change agents, such as extensionists, with more in-depth knowledge about the main logics guiding the culture of farming, and the mechanisms by which farmer practices, beliefs and values may change. The in depth-knowledge will help to communicate, frame and organise extension initiatives.

1. Introduction

The agricultural sector is responsible for approximately 25% of global greenhouse gas (GHG) emissions (IPCC, 2014; Le Quéré et al., 2016), as well as creating other environmental impacts (Kastner et al., 2012), such as contributing to surface and groundwater pollution (De Klein and Ledgard, 2005). The Scotland and New Zealand agricultural sectors are facing both these challenges. In response, communities,

scientists, policy-makers and industries are requiring farmers to improve environmental practices in farm management. Farmers are, therefore, under increasing pressure to adopt environmental practices aligned with 'external' societal and political expectations of good farming (Hart, 2017; Leggett, 2017) to maintain their license to farm (Edwards et al., 2019; Edwards and Trafford, 2016; Marsden, 2010). For sustained environmental change, not only practice adoption, but also a change in beliefs and values is required (Burton, 2004a; McGuire et al., 2013).

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<https://doi.org/10.1016/j.jrurstud.2020.06.037>

Received 22 November 2019; Received in revised form 1 June 2020; Accepted 15 June 2020

Available online 17 July 2020

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Historically, the dominant farming cultures in Scotland and New Zealand, from here on referred to as ‘farming cultures’, have been based on the beliefs and values of maximising food production and maintaining the family business (Burton, 2004a; Rosin, 2013; Wilson, 2001). The pressure from societal calls to improve environmental practices in farm management leads to an institutional clash. This is a phenomenon previously studied in non-agricultural settings, such as law (Smets et al., 2012), in which pressure, for example societal pressure or economic pressure, requires actors to change their practices, which do not align with their current values and beliefs. In the case of Scotland and New Zealand farming, societal and governmental pressure to adopt environmental farming practices does not align with the dominant farming beliefs and values of maximised productivity and family business, which therefore causes a clash (Burton, 2004a; Burton and Wilson, 2006; Haggerty et al., 2009; Marsden, 2010; Wilson, 2001).

To embed values, beliefs and practices around environmental farming within the farming culture, policies (e.g., regulatory frameworks, market-based instruments, research and extension programmes) have been applied (Greiner and Gregg, 2011; Lockie, 2013). Participatory extension programmes (PEPs) have been shown to be a popular policy, because they have the ability to incorporate the biophysical, economic and social heterogeneity of the agricultural sector (Darnhofer et al., 2012) in generating change on-farm. In PEPs (also referred to as participatory research and extension programmes (Percy, 2005)), farmers and technical experts are included (2016b; Knook et al., 2018; Vrain and Lovett, 2016), and all actors are participants in knowledge generation and practice change via experimentation on farm, and by demonstrating and scrutinising practices in discussion groups with peers, experts and researchers (Cristóvão et al., 2012; Scoones and Thompson, 2009). These PEPs aim to increase farmer resilience to environmental challenges by embedding new practices within the farming culture (Burton and Paragahawewa, 2011; McGuire et al., 2013). Previous research shows that PEPs are recognised for achieving practice change (e.g. Goodhue et al., 2010; Läßle et al., 2013; Läßle and Hennessy, 2015; Tamini, 2011), but there are concerns that while PEPs successfully lead to practice adoption, they may not lead to sustained change, because of not changing beliefs and values required to embed new practices in the farming culture (Sewell et al., 2017). These concerns suggest that there is a need for increased understanding of the individual, and societal-level mechanisms by which PEPs can not only change practices, but also reshape beliefs and values.

To increase understanding into how farmers handle the institutional clash and the role of PEPs in responding to the institutional clash, this study applies an institutional perspective. This perspective enables us to study the role of PEPs in not only influencing the adoption of practices, but also in reshaping beliefs and values in response to wider institutional changes (as called for by Inman et al. (2018)). Institutions are ‘the more-or-less taken-for-granted repetitive social behaviours, which give meaning to social exchange and enable self-reproducing social order’ (Greenwood et al., 2008 p. 5). Farming culture is such an institution, consisting of practices, beliefs and values that constitute ‘good farming’ (McGuire et al., 2013). To achieve change, a shift in values, beliefs, and practices, so called institutional logics, is required (Osei-Amponsah et al., 2018; Smets et al., 2012). There is interest in organisational studies (Micelotta et al., 2017; Smets et al., 2012) and increasingly in rural sociology (Knook et al., 2020b; McGuire et al., 2013) in understanding the mechanisms contributing to and eventually leading to the unfolding of a change in logics. There have been calls for research studying mechanisms of change in farming culture (Burton, 2004b; Inman et al., 2018), but few studies explore what mechanisms may successfully stimulate changes in values and beliefs underpinning environmental practices in agriculture (Burton, 2004a; McGuire et al., 2013).

To address this gap, we study change in farming culture after an institutional clash and identify change mechanisms. Furthermore, we study how these mechanisms can be provided by PEPs, because this is a

commonly favoured policy approach to change. Our study moves beyond a sole focus on attitudes, behaviours, or adoption of environmental practices (e.g. Baumgart-Getz et al., 2012; Pannell et al., 2006), to study change from a holistic perspective by considering the practices, beliefs and values that constitute farming culture. The relationship among these concepts is depicted in Fig. 1. Four questions address the main study aim: i) what are the dominant logics (practices, beliefs, and values) that constitute farming culture in NZ and Scotland? ii) have these logics changed in the last decade due to external expectations? iii) what mechanisms have influenced this change? and iv) how have PEPs contributed to this change?

The following sections provide an overview of the conceptual framework, followed by a description of the methods, including case study areas. Then the findings are presented and discussed, and theoretical and practical implications provided.

2. Conceptual framework

This section presents institutional logics, which are ‘the socially constructed, historical patterns of cultural symbols and material practices, including assumptions, values, and beliefs, by which individuals and organisations provide meaning to their daily activity, organise time and space, and reproduce their lives and experiences’ (Thornton et al., 2012 p. 2). Furthermore, this section outlines a framework for exploring mechanisms of change in logics. These mechanisms have been studied in both organisational studies and rural sociology.

2.1. Institutional logics

The majority of the organisational studies literature on institutional change has focused on sudden and large changes on a field-level, i.e. a whole sector (Micelotta et al., 2017). It is, however, acknowledged that institutional change can also start at an individual-level and diffuse slowly (Thornton and Ocasio, 2018). For example, practice-level change, which begins with organisational practice change, leads to an institutional change by initiating changes in beliefs and values, and practices then diffuse to other organisations and eventually to field-level (Smets et al., 2012). In the agricultural sector, change is stimulated on an individual level via PEPs, to account for the large heterogeneity between farms (Darnhofer et al., 2012). Therefore, applying institutional logics to increase understanding into how PEPs can support a change in logics on an individual and field level, is very useful for policy makers

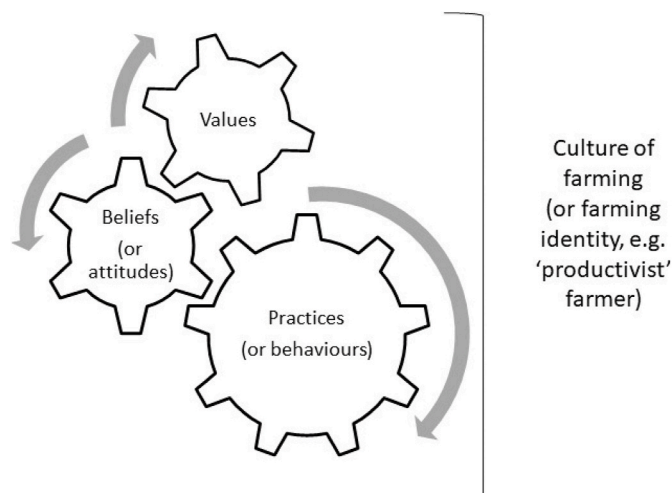


Fig. 1. The relationship between values, beliefs and practices, which together constitute the culture of farming. Included in the figure are concepts, e.g. attitudes, behaviours and farmer identity, which are used to indicate similar concepts in disciplines outside organisational studies.

and extensionists.

From an institutional logic perspective practice change is initially driven by an institutional clash (when multiple incompatible practices, beliefs and values exist). To ensure ongoing functioning of an organisation, this clash must be overcome by a change in logics, which means not only a change in practices, but also in beliefs and values.

2.2. Mechanisms contributing to a change in institutional logics

Mechanisms of institutional change help to understand how farming culture is being reshaped by the institutional clash. Previous studies (e.g. Gray et al., 2015; Smets et al., 2012) have identified mechanisms contributing to institutional change. Combined with studies in rural sociology that have studied change (e.g. McGuire et al., 2013), it has informed this study's conceptual framework (Fig. 2).

2.3. Micro-mechanisms

Five micro-mechanisms occur at an individual-level. The first, *situated improvising*, happens immediately after the clash when actors enter an experimental learning stage (Lounsbury and Crumley, 2007) to develop new practices (Orlikowski, 1996). *Network reorientation* and *elaboration* then support *situated improvising* by bringing together different and more actors to support development of the new practices. These mechanisms enable knowledge exchange around how and which practices can be implemented (Getz and Warner, 2006; Greenwood et al., 2011), helps assess the extent to which the practices address the clash, and introduces actors with different beliefs and values. *Double loop learning* can occur from the trust developed through sustained knowledge exchange with peers, experts and researchers (Franz et al., 2010; Rao et al., 2003; Sewell et al., 2014; Sherson et al., 2002; Röling, 2009). Via feedback loops, this learning changes frames of reference and

subsequently reshapes beliefs and assumptions (Argyris and Schon, 1996; Inman et al., 2018). A fifth micro-mechanism, *emotional intensification* (Gray et al., 2015), occurs by creating an emotional connection among actors when focusing on the same activity, for example when researchers, extensionists and farmers work through a problem together by discussing experiments and solutions. The joint creation of an emotional connection also supports the development of a new shared set of beliefs and values (Gray et al., 2015).

2.4. Macro-mechanisms

The process by which practices become taken for granted, so thereby reshaping the frame of reference and redefining beliefs and values, is known as *amplification* (Gray et al., 2015). This mechanism is essential for practices to radiate to the field-level, i.e. how new practices and associated beliefs and values radiate to other businesses in the sector. After *emotional intensification* on an individual-level, *amplification* is achieved by two macro-mechanisms: i) *scope expansion* through adoption of new practices by a broader group of people, who in turn might be connected to other groups; and ii) increased *regularity and frequency* of a new practice and its terminology due to repetition of practices in stable networks. The new practices, and associated beliefs and values, then become institutionalised. Another macro-mechanism, *unobtrusive embedding*, explains the diffusion of the practice to a field-level by a bottom-up approach with active engagement of actors in the practice itself. The bottom-up approach may make the new practice difficult to resist compared to practices imposed top-down (Quack, 2007).

2.5. Enabling dynamics

To achieve successful change on an individual- and field-level, Smets et al. (2012) highlight enabling dynamics in addition to micro- and

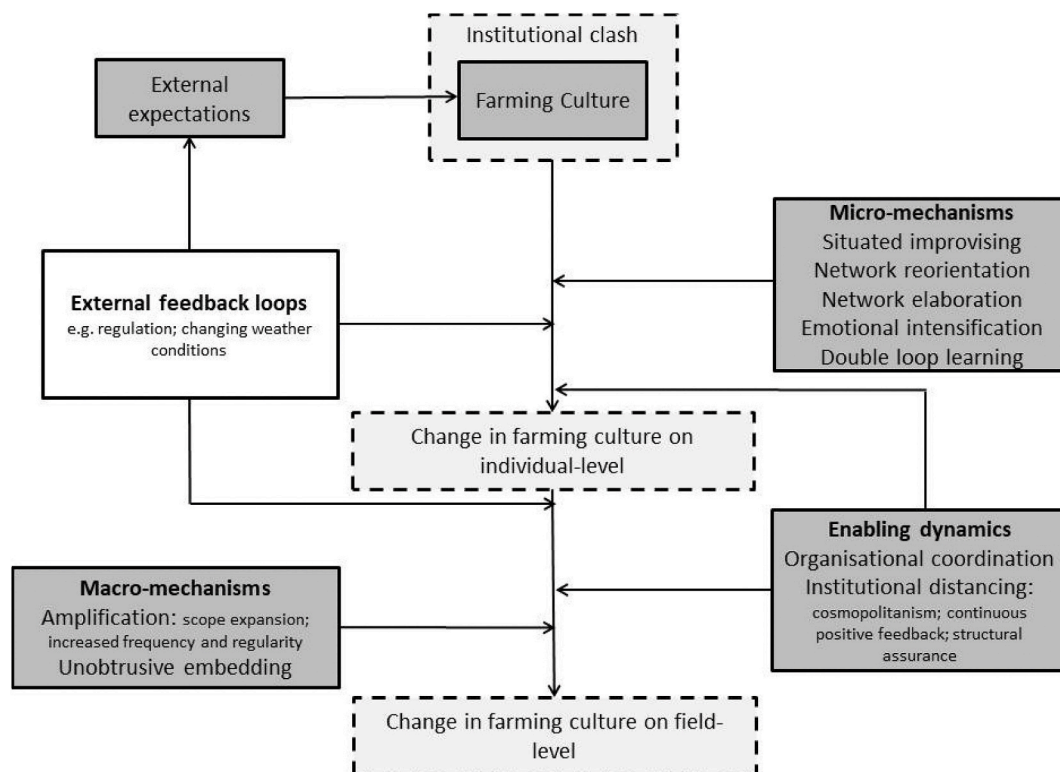


Fig. 2. An overview of mechanisms contributing to the change of the institutional logics of farming culture. The clash arises due to external expectations regarding the implementation of environmental practices. Consequently, mechanisms of change (in dark grey boxes), assisted by external feedback loops (in white box), contribute to a change in farming culture on an individual-level. Subsequently, new practices, beliefs and values can move up to a field-level (the whole sector) through amplification and unobtrusive embedding.

macro-mechanisms of change. The first enabling dynamic is *organisational coordination*, which follows *situated improvising* by formalising the practices and outcomes from that improvisation. These clarified practices and outcomes can be diffused to other actors. A second enabling mechanism is *institutional distancing*, which aims to weaken actors' commitment to existing logics that clash with the new logic, via three sub-mechanisms: *cosmopolitanism*, which is the inclusion of actors who are not part of the usual beliefs embedded in existing logics (which can lead to institutional bricolage, in which new practices, beliefs and values from different institutions are pieced together (Osei-Amponsah et al., 2018)); *continuous positive feedback*, which refers to receiving constant positive messages from peers and experts that the new practices are working; and *structural assurance*, which refers to providing change actors with enough space to accept new logics and thereby minimising the pressure to maintain the dominant logics of the current culture.

2.6. External feedback loops

In addition to the internal mechanisms of change, *external feedback loops* are required (Beers et al., 2014; Klerkx et al., 2010). These external feedback loops can for example be pressure of incoming regulation (Legett, 2017), or observing changing climatic conditions, such as prolonged drought, which stimulates a need to address environmental issues to make their farm more resilient to future change (McGuire et al., 2013).

3. Methods

We will study institutional logics through their expression in language and practice (Thornton et al., 2012). This approach to studying logics provides insight into the dominant logics underlying farming culture. We used observations and interviews to identify the mechanisms of change experienced by farmers in this study.

3.1. Study area

Scotland and NZ were selected as study areas, because both countries: i) faced environmental challenges in the agricultural sector (IPCC, 2014; Roy, 2019); ii) had similar economic prosperity; and iii) relied on voluntary initiatives to achieve on-farm change (for climate change in Scotland and water quality in NZ). There was also an important difference between the two countries: the NZ context, characterised by an unsubsidised *laissez-faire* approach, mostly relied on industry bodies and the community to set standards for good farming practice (e.g. DairyNZ, 2017); The Scottish context was characterised by high regulation, and faced most change via governmental policy, such as marked-based approaches and voluntary extension programmes (The Scottish Government, 2017). Being able to consider the influence of two different socio-political contexts has potential influence on the working of the PEPs and might present relevant lessons for countries facing changes regarding their agricultural policy, such as post-Brexit policy in the United Kingdom.

3.2. New Zealand

Canterbury in New Zealand's South Island was selected as the NZ study region; an area that accounts for approximately 20% of national agricultural land (Stats, 2013). Due to intensification of agricultural land use, e.g. over the last decade many farms in Canterbury had changed their land use from sheep and beef farming into dairy farming, nitrate leaching has been a major issue and farmers have been faced with societal pressure to implement environmental farming practices to maintain their license to operate (Edwards et al., 2019; Edwards and Trafford, 2016; Legett, 2017). Hence, the Canterbury region served as a perfect area to study the institutional clash. Furthermore, the PEP 'Forages for Reduced Nitrate Leaching' was implemented in this region,

which led us to be able to study the effect of the institutional clash, as well as participation in the PEP. The NZ PEP was a participatory research and extension programme on nitrate leaching. The programme started in 2013 and aimed to reduce nitrate leaching by 20% from dairy, arable, and sheep and beef farming (DairyNZ, 2017) by applying a participatory research and extension approach to maximise the uptake and development of beneficial forage practices, such as mixed-species pastures, crops with low nitrogen content and catch crops (Pinxterhuis et al., 2018). Researchers, extensionists and nine monitor farms in Canterbury, consisting of four dairy farms, two arable farms, two sheep and beef farms, and one mixed arable and dairy farm, participated in the programme for six years. The NZ PEP applied an experimental approach, in which researchers, experts and farmers discussed what practices would be suitable on-farm and consequently experimented with these practices. In general, all PEP participants gathered at least once a year to discuss findings during two field days. Besides that, there were sub-teams, each consisting of a monitor farm, researchers and extensionists, with the latter providing scenario modelling for the farm, conducting experiments on-farm and discussing findings with the farmer. These sub-teams were in touch approximately four times a year. The PEP did not organise regular discussion meetings. However, knowledge sharing outside of the PEP was possible, because participants were strongly embedded in their personal networks.

Fifty-two farmers were interviewed, of which 12 participated in the PEP (NZ PEP farmers). To gain insight into the diffusion of practices, beliefs, and values, 18 farmers in the network of participants (NZ network farmers) were included in our analysis. Furthermore, to allow insight into how much the PEP contributed to change beyond the influence of the institutional clash, we included 22 farmers not involved in the PEP (NZ non-PEP farmers).

3.3. Scotland

In Scotland no specific region was selected, because the PEP in Scotland, Farming for a Better Climate (FFBC) (Scotland's Rural College, 2020), was set up to include farmers across Scotland. The PEP in Scotland focused on stimulating the uptake of no-cost climate change mitigation measures: practices that reduce emissions while maintaining (and in some circumstances increasing) farm profits (Scotland's Rural College, 2020). This PEP was initiated in 2010 by the Scottish Government with the aim of achieving a 'low carbon society' (The Scottish Government, 2010) and was at the time the main policy tool to address emission reduction on-farm. At the time the farmers participated in our study, the PEP had been running for seven years. The institutional clash Scottish farmers were facing was, on the contrary to New Zealand, not as strongly caused by societal pressure, but more by Governmental pressure to include the agricultural sector in achieving a low carbon society. Hence, on the contrary to the NZ case study in which societal pressure played a large role, in the UK it was possible to study the effect of the clash caused by political pressure.

The selected groups were located in different parts of Scotland and had all participated in the Scotland PEP. The Scotland PEP consisted of 13 monitor farms, four between 2010 and 2013 and nine between 2014 and 2017, where discussion group meetings were hosted once every two months over three years, to discuss the implementation of (scientifically-proven) practices on farm. Participation in the discussion groups was voluntary and as a consequence the group composition changed through time, depending on the schedule and interest of the farmers. The meetings included multiple methods of knowledge exchange: experts were invited to present new information to farmers, farmers were invited to attend a demonstration site of the focus farm, and facilitators moderated a group discussion. Learning in the discussion group was undertaken on a farmer-to-farmer level, as well as among farmers, experts and facilitators. The 20 interviewees (Sc PEP farmers) were part of the discussion groups, but not all engaged to the same extent: 10 farmers attended more than 3 meetings and the others 2–3 meetings. Hence, the

farmers included in the interviews had not, in contrast to the NZ monitor farmers, necessarily participated in all meetings over a three year period, nor had a specific team of experts to work with.

3.4. Data sources

To ensure a rich accumulation of data to draw inferences from, we aimed to obtain information from multiple resources, including in-depth interviews and participant observations. The first author conducted interviews and participant observations from May 2017 until December 2018.

3.5. Literature

To gain insight in the history of the New Zealand and Scotland farming culture and the dominant logics, a literature review was conducted. This, together with interviews and observations, constructed an overview of the farming cultures in Scotland and New Zealand.

3.6. Interviews

Seventy-two face-to-face interviews were conducted: 52 with NZ farmers (Appendix, Table 1) and 20 with Scottish farmers (Appendix, Table 2). Each interview lasted 1–3 h, was audio-recorded and completely transcribed. The method of oral history interviewing was used, in which the interviewee was asked to reflect upon a specific period in the past (Bryman, 2012) to gain insight into the logics of farming, how these logics changed during the last 5–10 years and what caused them to change (the interview questions are provided in the Appendix). The period of 10 years was chosen, because this included an amount of time before any PEP development and regulation. If the respondent mentioned any changes, a follow-up question was asked to elaborate on the motivation for this change. Hence, follow-up questions depended on their response and emerged based on the changes they had made. To gain insight into how the PEP contributed to a possible change, NZ and Sc PEP farmers were asked extra questions regarding the changes they had made due to PEP participation.

The NZ sample, with an average farmer age between 40 and 50 years old, represented the average age of New Zealand farmers; 47.7 years in the 2013 agricultural census (Stats, 2013). The sample of Scottish farmers represented the Scotland farming population and the average age was therefore higher; between 50 and 70 years (Farm Advisory Service, 2016). Although there is an age difference between the farmer samples, we did not observe a difference in responses based on age. However, compared to the NZ farmers, fewer Scottish farmers had succession plans.

3.7. Observations

Before conducting the interviews, discussion group and farmer-advisor meetings were observed. These observations were conducted to focus on individual actors, which provided detailed insight into their work (Jarzabkowski et al., 2009; Kellogg, 2009). We conducted nine observations in NZ during: i) five meetings between farm advisors and farmers, ii) one discussion group meeting, and iii) three field day meetings. In Scotland we conducted four observations, all of FFBC field days. During the observations notes were made on aspects such as the interaction and communication between participants, the diversity of actors attending the meeting, and the topics being addressed. These notes were included in the coding process. Besides confirming the findings from the interviews, the observations were instrumental in providing the farming context in both Scotland and NZ and in developing the conceptual model.

3.8. Data analysis

An inductive methodology was used to identify the logics in farming culture. Subsequently, the conceptual framework described in this paper was used to identify the mechanisms by which these logics had changed (Yin, 2013). Based on the conceptual framework and the data we suggested how a PEP could contribute to change in farmers' practices, beliefs and values. The interviews and observations were analysed using NVivo 12 (QSR International Pty Ltd, 2018).

3.9. Ethical considerations

The research was conducted after approval from the University of Edinburgh Ethics Committee. Ethical considerations in this research included the following. Firstly, to prevent us from unexpectedly or unwantedly approaching participants, the participants received an email from programme coordinators and extensionists in NZ, asking whether they were willing to participate in our research. Only after confirmation were participants contacted. In Scotland a survey was conducted the year before the interviews and participants who indicated their willingness to participate in follow-up research were contacted. Secondly, any potential discomfort in answering questions was addressed by sending the interviewees the questions approximately one week before the interview took place. Thirdly, to prevent cultural issues, the researcher conducting the interviews visited at least five farms in Scotland and New Zealand before the interviews to familiarise herself with the respective farming systems. Fourthly, participants were assured that at any point in time they could choose to withdraw from the interview, observation or research in general, assuring that their transcript or recordings would be deleted immediately. Lastly, confidentiality was assured by anonymising the data and safely storing the data making it only accessible to the researchers. Participants were asked to sign an informed consent form outlining the above mentioned points, which were discussed at the beginning of each interview.

4. Findings

Findings show Scottish and NZ farming cultures are guided by multiple logics: *business*, *farming lifestyle*, *family*, and *learning*. The *farming life* and *family* logics did not change due to the institutional clash for both the Scotland and NZ farmers. However, the *business* logic did change for both the Scotland and NZ farmers. Due to NZ farmers participating in the PEP, the *learning* logic moved from a *linear learning* towards a *multi-actor learning* logic.

We will first elaborate on the institutional clash, before describing each of the logics derived from the interviews and observations (Table 1). Subsequently we will explain the mechanisms of change and how PEPs contribute to this change (Fig. 3).

4.1. The institutional clash

The historical development of farming towards an institutional clash

The development of the NZ and Scottish (part of the United Kingdom (UK)) agricultural sectors has for a long time been strongly dependent on each other. Up until the 1970s the main objective of NZ agriculture was helping feed the UK during industrialisation and World War I and II (Brooking and Pawson, 2010; Rosin, 2013). This objective stimulated a strong productivist mentality amongst farmers, in which the focus was on maximising yields through intensive production (Burton, 2004a; Burton and Wilson, 2006; Haggerty et al., 2009; Wilson, 2001). From the 1970s onward, the dependence of the UK on NZ changed. The UK became a member of the European Union (EU) in 1973 and adopted its Common Agricultural Policy (CAP). This membership led the UK to become self-sufficient on an EU-level by paying farmers for their produce (further stimulating a productivist mentality) and providing them

Table 1

Multiple logics present in Scotland and NZ, explained by values, beliefs/assumptions and rules/material practices.

Business logic (adhered to by Scotland farmers, NZ PEP farmers, NZ network farmers, NZ non-PEP farmers)	
Values	Farm profit-oriented goals
Beliefs/assumptions	Entrepreneurship, animal welfare, land care, employee well-being and efficient production is essential to keep the business running in the future; ease of running the farm is important to keep the workload low; being aware of subsidy policy is essential in optimising farm management and finances; and taking into account the 'public eye' is important to maintain legitimacy to farm.
Rules/practices	Implementation of 'win-win' measures that have multiple benefits, e.g. economic and environmental; diversification into a new branch of business; self-sufficient in energy supply; minimise staff hire; manage farm to optimise subsidy use; minimise business expenses by e.g. in-house vehicle repair; owner takes strategic role to manage the business; and tidy looking farm.
Farming lifestyle logic (adhered to by a subset of Scotland farmers, NZ PEP farmers, NZ network farmers, NZ non-PEP farmers)	
Values	Farming lifestyle and allowing continuation of farming lifestyle before retirement.
Beliefs/assumptions	Maintaining farm lifestyle for own ambitions.
Rules/practices	Simplify practices and minimise changes to allow staying on the farm if possible.
Family logic (adhered to by a subset of Scotland farmers, NZ PEP farmers, NZ network farmers, NZ non-PEP farmers)	
Values	Providing future family opportunities and family cohesion.
Beliefs/assumptions	Duty to provide the next generation with the option to continue farming.
Rules/practices	Diversification of income; expansion of the farm for enough work; traditionalism (continue practices of previous generations as sign of respect or because this has always worked in past); and carry on business to keep options open; focus on long term gain.
Linear learning logic (adhered to by Scotland farmers, NZ network farmers, NZ non-PEP farmers)	
Values	Information collection to stay up-to-date with recent developments and regulations.
Beliefs/assumptions	Experts and researchers develop regulation and guidelines, farmers are to adapt their on-farm management based on the regulation and guidelines.
Rules/practices	Attending information meetings; become a member of local committees, such as irrigation committees.
Multi-stakeholder learning logic (adhered to by NZ PEP farmers)	
Values	Multi-stakeholder learning and information exchange; integrating knowledge of experts, researchers and farmers to create successful on-the-ground solutions.
Beliefs/assumptions	More openness to change by farmers due to increased understanding that knowledge leads to better farm management; better aligned research due to researchers' understanding of the farm leads to more benefits of research for farm.
Rules/practices	Direct knowledge exchange between farmers and researchers; and facilitation of knowledge exchange meetings.

with guaranteed markets. Due to the decreased food demand, NZ experienced several crises leading to a significant decrease in government support (Gouin, 2006), such as the removal of farm subsidies in 1982/83. At the same time changes were made to the CAP in the UK. Farmers had been stimulated to maximise on-farm production, but negative environmental effects, such as water pollution and soil impoverishment, started to emerge (Delayen, 2007). The negative effects led to CAP reforms in which a small subset of subsidies were moved away from enhancing food production (Hanley et al., 1999), which caused UK farmers to develop a stronger economic focus. Similarly, the removal of subsidies in NZ also led to a stronger economic focus. In both countries a 'business farmer' identity, which refers to farmers who take up practices to maximise profit instead of to maximise production, was stimulated (Burton and Wilson, 2006; Hunt et al., 2013).

Due to the historical emphasis on maximising production and the

development of the business mentality, the shift towards a more environmentally friendly farming culture has been challenging during the last two decades. The values and beliefs of the business and productivist culture have not aligned with the practices of an environmentalist culture. For example, mono-cropping has long been regarded as the most productive and profitable practice. However, from an environmental perspective the practice of poly-cropping would be preferred. This practice has thus clashed with 'good farming' beliefs and values (Egoz et al., 2001), which farmers need to demonstrate to maintain their license to operate (Edwards et al., 2019; Edwards and Trafford, 2016; Legett, 2017). Farmers have therefore tended to be interested in the uptake of environmental farm measures that demonstrate business success, and thus align with business values and beliefs, rather than less tangible signs of 'environmental farming', such as planting buffer strips (Burton et al., 2008; Collins et al., 2016). Hence, farmers have been less likely to adopt new practices if these practices do not align with their dominant values and beliefs about 'good farming' (Burton, 2004a; Hulst et al., 2020; Inman et al., 2018; McGuire et al., 2013).

Besides a focus on productivity and profitability, most farms are currently still family businesses and have an ambition to hand over their business to the next generation. They have therefore been likely to take decisions that benefit the farm long-term. This long-term thinking has led farmers to, for example, increase the size of their farm or convert their business to a more profitable form of farming (Copland and Stevens, 2012). Sutherland (2010) showed that farmers are more likely to comply with environmental legislation if this improves long-term farm viability. Although currently most farms are still family farms, there is a recent change occurring in farm ownership and management in Scotland and NZ. Due to factors such as the lack of succession or impossibility to purchase a farm, the corporate governance model is gaining popularity (Nuthall and Old, 2017). These farms are often quite focused on short-term financial gain. Knook et al. (2020a) showed that farms with a corporate structure tended to have a short-term decision-making horizon, which might influence the intrinsic motivation to implement environmental changes. However, since most farms are still designed according to the family model, in this paper we do not focus on the influence of the corporate model.

Current observation of the institutional clash

External expectations regarding the uptake of environmental practices have put farmers in a position in which they need to change, but this position has caused a clash within their current logics. Therefore, most farmers in both Scotland and NZ have struggled to align the need for practice change to their current farming beliefs and values, as evidenced by the following quote:

"Well most of the [agri-environmental] schemes involve taking land out of production, to set it aside, or to change it. For the size of farm that we have, I think we need every bit of land possible. It doesn't really fit the system. And we are not an extensive farm, we are quite small, so we have to be quite intensive. So taking land out of production does not fit that ethos." – Scottish interviewee 18

Furthermore, although all NZ and Sc farmers acknowledged environmental practices to be important, the majority of farmers still described good farming according to a production-focused business logic:

"We want it to be a profitable farm, tidy farm. We like things to look good – tidy [...], well organised. [...] Things are kept well and the grazing is done well and the animals looked after well, the staff looked after well. Just a well-organised and a tidy looking farm, yeah." – NZ interviewee 5 PEP farmer

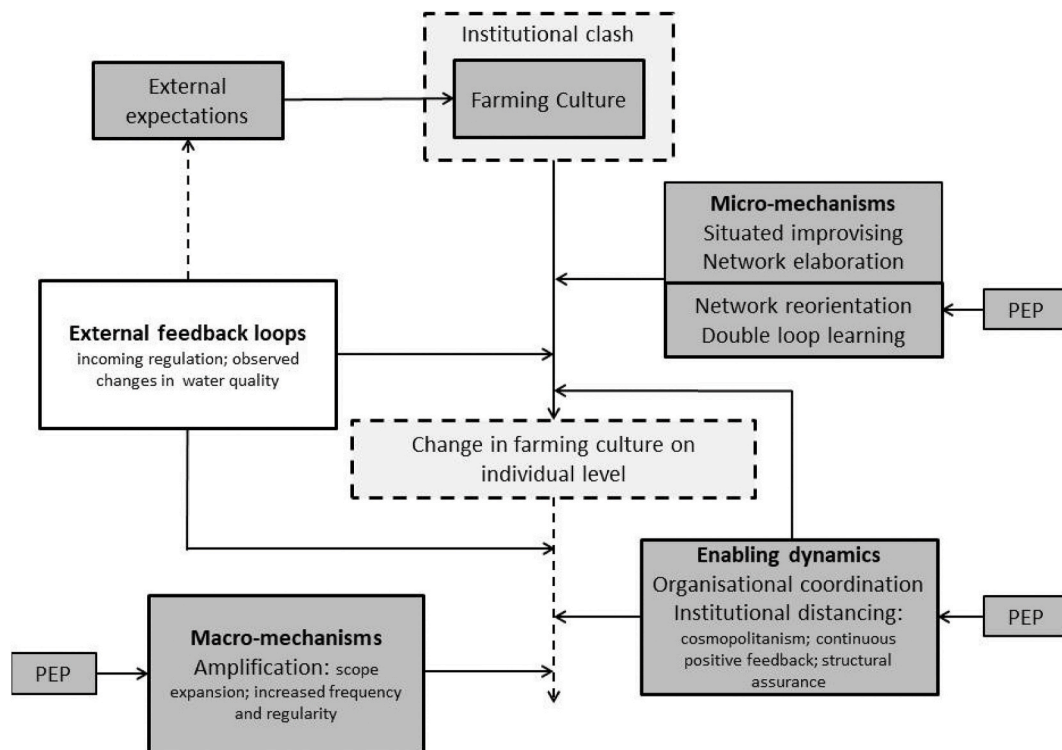


Fig. 3. Overview of the findings of the research, depicting the institutional clash and the mechanisms observed, which mechanisms lead to a change in institutional logics in our study. Only a change on an individual-level is depicted, because no change on a field-level was observed. PEPs did however attempt to implement mechanisms to ensure amplification, but these mechanisms did not result in change on a field-level.

4.2. The development of the logics of farming

All NZ and Sc farmers adhered to multiple logics, of which the *farming life*, *family* and *business* logics were expressed by all. While the *farming life* and *family* logics did not change due to the institutional clash, the beliefs and practices underlying the *business* logic did change for all NZ and Sc farmers. The *learning* logic changed completely for NZ PEP farmers due to PEP participation. The logics are described in Table 1. Table 2 provides an overview of how the logics have changed for each of the four farmer groups.

4.3. No institutional clash: farming life and family logic

All farmers expressed either the *farming life* or *family* logic. The *farming life* logic is about maintaining a lifestyle on-farm, in which farmers did not focus on succession, but valued their life on the farm and wanted to stay there if possible. This value was most prevalent in the Scotland farmer group, i.e. half of the Scotland farmers adhered to the farming life logic, because not many Scotland farmers had succession plans in place, but wanted to maintain their farming lifestyle until retirement. The family logic was expressed by for example simplifying on-farm labour by the practice of contracting out work to make work less labour intensive, as illustrated by one of the Scottish interviewees:

“I have a year or ten before I can retire and before I probably want to. I suppose some of the decisions we are making within the practicality of the farming, is that we are making things simpler. So it’s less labour intensive, and easier to accomplish.” – Scottish interviewee 2

In the *family* logic, succession and offering the family the farming lifestyle were important. This logic was expressed by farmers who valued succession or family living on the farm. Farmers with the *family* logic believed long-term decision-making is essential. Practices included the purchase of more land and the conversion to a different type of farming, as shown in the following quote:

“I think we will try and stay here for a while, or that’s the plan, because I also have a younger brother who is going to come home and farm. And the farm in [town] was not big enough for the both of us. So we bought this with the idea that it is big enough for both me and him.” – NZ interviewee 20 Network PEP

4.4. Changing practices and beliefs: business logic

All farmers expressed a *business* logic, which mostly consisted of the value of a profitable farm. Both NZ and Sc farmers indicated they achieved this by maximising productivity, but the external pressures for environmental practice change has led to the belief that a profitable farm is achieved by ‘ticking the boxes’. This belief means that the business focus moved from productivity only, to a wider focus; productivity as well as complying with environmental regulation, health and safety, etc.:

“Animal welfare, environment, those are the things that should be a box that we are able to tick to show what we are doing. Especially if you look at the future of NZ as a premium food producer, if that is the goal, we have to tick those boxes, it’s part of our business.” – NZ non-PEP interviewee 52

This change was illustrated by the practice of farm conversion in Canterbury. Converting from sheep and beef farming to dairy farming (in areas where water was available for irrigation), increased farm productivity and was a step towards more profitability. However, the conversions to dairy farming have caused Canterbury to struggle with larger environmental impacts. Due to external pressure, farmers have realised that running a profitable business no longer entails a sole focus on productivity, but also on labour and resources:

“Just being efficient in terms of labour, resources, products and that also flows on productivity and profitability. So that all just ties in [...]

Table 2

An overview of the logics before and after the institutional clash for the different farmer groups.

Farmer group	Logics before clash	Logics after clash	Explanation
Scotland PEP farmers	Farming lifestyle logic; Family logic; Business logic; Linear learning logic	Farming lifestyle logic; Family logic; Business logic; Linear learning logic	No change in logics was observed, but after the clash Scotland PEP farmers did display a change in the beliefs and practices underlying the business logic. Before the clash beliefs and practices were mainly focused on maximising profit. After the clash, beliefs and practices were still aimed to maximise profit, but also included aspects such as compliance with environmental regulation.
NZ non-PEP farmers and NZ network farmers	Farming lifestyle logic; Family logic; Business logic; Linear learning logic	Farming lifestyle logic; Family logic; Business logic; Linear learning logic	No change in logics was observed, but after the clash NZ non-PEP and network farmers did display a change in the beliefs and practices underlying the business logic. Before the clash beliefs and practices were mainly focused on maximising productivity. After the clash, beliefs and practices were aimed at production efficiency and included aspects such as compliance with health and safety, environmental regulation.
NZ PEP farmers	Farming lifestyle logic; Family logic; Business logic; Linear learning logic	Farming lifestyle logic; Family logic; Business logic; multi-stakeholder learning logic	A change in one logic was observed in NZ PEP farmers: the learning logic. NZ PEP farmers believed in co-construction of knowledge by the inclusion of multiple actors, other farmers did not mention developing new beliefs around obtaining information. The development of new values, beliefs and practices by PEP farmers developed due to the direct and frequent engagement with multiple stakeholders during the duration of the PEP.

That would be one major change, yes now more about efficient production instead of maximum production.” – NZ PEP interviewee 1

NZ and Scottish farmers coped differently with the institutional clash. NZ farmers were more under pressure by ‘the public eye’ than Scotland farmers, which led to the belief that to run a good business it is in practice necessary to tick the environmental boxes to an extent that satisfies the public:

“Well as I say, it influences really in terms of like – as I say, if we’re going to have these lovely native plants along our roadside, we’re going to do it here where the public are, rather than doing it somewhere no one goes.” – NZ non-PEP interviewee 38

Farmers in Scotland were embedded within a subsidised farming system, which led to the overall belief that changes towards the environment should only be made when subsidised. Hence, due to the different socio-economic context, all NZ and Scotland farmers adhered to the same value of running a profitable business. However, with subsidies in the Scottish farming system, the Scottish farmers had different beliefs and practices regarding how to achieve that value than NZ farmers:

“But obviously we are manipulating the [subsidy] system to suit our activities, at least to a point. I mean now we don’t have to do greening. I have 75% in grass, so I am allowed a 100 acres of green, without having greening and setting aside.” – Scottish interviewee 1

Overall, Scottish and NZ farmers experienced the institutional clash and are including environmental practices in their business logic. However, the majority of farmers did not adopt environmental practices because these practices reflect a value of their farming culture, but because it is needed to maintain a profitable business.

4.5. Development of a new logic: the multi-actor learning logic

All farmers adhered to a third logic, the *learning* logic, though it differed between NZ PEP farmers and other farmers. NZ PEP farmers developed a *multi-stakeholder learning* logic, whereas other farmers expressed a *linear learning* logic. While NZ PEP farmers believed in co-construction of knowledge by the inclusion of multiple actors, other farmers did not mention developing new beliefs around obtaining information. The development of new values, beliefs and practices by PEP farmers developed due to the direct and frequent engagement with multiple stakeholders during the duration of the PEP. The farmers expressing the *multi-stakeholder learning* logic valued the integration of expert-based knowledge to be able to create context-based solutions. Through the practice of multi-stakeholder meetings and discussions of new practices, knowledge was successfully exchanged between multiple stakeholders:

“It has been good meeting them and getting to know them, so in the end if I have questions I can go straight to them, with questions about anything. And likewise, if these researchers have an idea and they could potentially come straight to me to see if I think it would work, or if I want to participate or things like that.” – NZ PEP interviewee 4

4.6. Mechanisms of change

There were a number of mechanisms observed that stimulated change amongst Scottish and NZ farmers, either stimulated by the PEP or not. An overview of the observed mechanisms and how these mechanisms were observed can be found in Table 3.

NZ and Scottish farmers have changed the practices and beliefs underlying the business logic, but maintained the primary value: a profitable business. The beliefs to achieve profit shifted from a productivity focus to more holistic management, including environmental compliance. The change in beliefs and practices originated on a practice-level via *situated improvising*. All NZ farmers were faced with having to reduce their nitrate leaching emissions, which led the majority of them to start experimenting, such as this NZ farmer who, before participation in the PEP, made management changes:

“I think two years ago we removed about 15 per cent of the herd or something. Then we produced 1 per cent less milk or so per season. So the cows were a lot less efficient before. We cut the amount of

Table 3

Evidence of mechanisms of change observed amongst the studied farmers.

Category of mechanisms	Mechanisms	Achieved by	Observed in
Micro-mechanisms	Situated improvising	Independent experimentation by farmers after announcement of nitrate leaching caps to be set in NZ	Most NZ farmers. Not amongst Scottish farmers.
	Network elaboration	Becoming part of or attending meetings of irrigation committees and other groups responding to nitrate leaching.	Approximately 20% of the NZ PEP-network and non-PEP farmers. Not amongst Scottish farmers.
	Network reorientation	Frequent interaction with researchers and experts that allowed PEP farmers to move from being knowledge consumers to knowledge co-constructors.	Only NZ PEP farmers.
	Double loop learning	Long term interaction with all actors as part of the PEP. This allowed discussion and reflection on the environmental and financial goals of new practices, as well as reflection on decision-making rules for implementing new practices.	Only NZ PEP farmers.
Macro-mechanisms	Amplification – scope expansion	Hosting discussion group meetings on monitor farmers to reach a wider group of farmers.	Only Scottish PEP farmers.
	Amplification – increased frequency and regularity	Selection of three focus practices by PEP farmers, and communicate these to the wider sector.	Only NZ PEP, who then communicated this to the sector.
Enabling dynamics	Organisational coordination	Identifying and coordinating a focused set of PEP outcomes based on situated improvising.	Only NZ PEP.
	Institutional distancing – cosmopolitanism	Bringing into the PEP experts adhering to different values, beliefs and practices	Only NZ PEP.
	Institutional distancing – continuous positive feedback	The PEP coordinator sharing previous successful case studies of multi-actor collaboration, leading participants to trust the programme design.	Only NZ PEP.
	Institutional distancing – structural assurance	Providing farmers with expert support to set up their new practices. This only partially achieved structural assurance, because no new advisory network was set up for the farmers.	Some of the NZ PEP farmers.
External feedback loops	Incoming regulation	The government announcing that nitrate leaching caps are being set.	The majority of the NZ farmers
	Observed changes in water quality	Farmers observing changes in the streams on the farm.	A minority of NZ farmers

supplements by half compared to what they were the year before. And then the ground, it has allowed us to do more regrassing. So we are growing more grass using a similar amount of nitrogen. The aim is actually to, this year hopefully, reduce this nitrogen.” – NZ PEP interviewee 1

Network elaboration occurred after *situated improvising*. Approximately 20% of all the NZ farmers included in this study, for example, became involved in irrigation committees or attended meetings hosted by policy-makers, to keep up to date with environmental developments:

“[Being a member of an irrigation committee] provides you with a wider perspective of what is going on and it also keeps you up to date with the wider picture of what is happening regarding the wider community here in terms of nutrient and environmental issues. I think it is [important], yes [...] If you want to be farming nowadays you have to look further than just inside your farm boundaries.” – NZ non-PEP interviewee 43

Overall, *network elaboration* did not change the values of the participating farmers, but did change their beliefs and practices underlying a profitable farm by complying with environmental regulation.

4.7. Mechanisms of change due to PEPs

PEPs specifically enabled *network reorientation*. The NZ PEP farmers indicated that before participation in the PEP, they were not used to direct interaction with researchers and technical experts; besides visits by farm advisors. The NZ PEP organised at least one meeting per year, inviting all actors involved in the PEP to discuss findings and experiments that had been set up at each of the monitor farms. These meetings were attended by approximately 30 people, from industry, research and farming. Amongst the participating farmers and experts *double loop learning* occurred due to their regular, long-term interaction. The interaction allowed for feedback moments via firstly collectively identifying problems on farm, followed by experiments on a monitor farm level, such as the growth of a new crop reducing nitrate leaching, and consequently bringing the results back to collective meetings in which all actors discussed the outcomes, which resulted in changes to the

experiment where necessary. The opportunity for identifying problems, conducting an experiment, and receiving feedback afterwards led the NZ PEP farmers to redefine their beliefs and values on knowledge acquisition. Instead of being knowledge consumers, farmers also became co-constructors of knowledge. The combination of *double loop learning* and *network reorientation*, in addition to *situated improvising* and *network elaboration*, led NZ PEP farmers to become *multi-actor learners*.

Double loop learning and *network reorientation* only led to a change on an individual-level, whereas we did not observe changes on a field-level. Due to the interaction of NZ PEP farmers with non-PEP farmers, for example at other farmer events or in the pub, we expected to observe *unobtrusive embedding*: farmers would informally discuss the success of their new approach to farming, which would then be adopted by a wider farmer group. However, farmers in the network of the NZ PEP farmers highlighted the difficulty of accepting new farming practices:

“There is a lot of stuff that came out from the [monitor] farm about fodder beet and the environment, the less emissions as well and all that kind of carry-on. It’s just crap I am afraid to say. I totally disagree with it, because the statistics are downright lies. It’s because it’s not looking at the whole picture, it’s looking at a small block in time. And not the big picture. Like the environment is about the big picture, it’s not about this bit, and this bit and this bit. It’s all about this bit. And it’s just statistics and downright lies.” – NZ network PEP interviewee 12

The same lack of credibility was observed for Scottish discussion group farmers, who had a sentiment that the monitor farmers who hosted the discussion groups did not always fully understand the practice changes that were discussed or demonstrated on the farm. Therefore, the monitor farmers did not always have credibility and thus the majority of the discussion group farmers had difficulty adopting new practices, beliefs and values, illustrated by interviewee 3:

“I don’t know if [the monitor farmer] fully grasps everything that all these cover crops can do either. There are people who were at the meetings who were more on board, or more embracing these things than maybe [the monitor farmer] was, so I probably learned more speaking to these guys, rather than actually any presentation or

listening what [the monitor farmer] was doing.” – Scottish interviewee 3

A mechanism to support dissemination to a field-level was *amplification*, requiring *emotional intensification* on an individual-level, followed by *scope expansion* and *increased frequency and regularity* to ensure dissemination to a macro-level. *Emotional intensification* was not observed in either of the PEPs. *Increased frequency and regularity* was observed in the NZ PEP. Participants in the NZ PEP selected three nitrate leaching reduction practices to focus on in the initial stages of the programme and consistently framed messages to ensure adoption (and knowledge) of these practices on a field-level. These practices were framed as low-cost options to reduce nitrate leaching. Farmers outside the PEP, including farmers outside the network of PEP farmers, were aware of the three practices. The Scotland PEP did not use the mechanism of *increased frequency and regularity*, but used *scope expansion*, by hosting discussion groups on monitor farms.

The NZ PEP also provided enabling dynamics. The NZ PEP provided *organisational coordination* by coordinating and pulling together a set of the PEP outcomes after the farmers independently conducted *situated improvising*. For example, the NZ PEP was a 6-year programme, which started off in the first years exploring options to reduce nitrate leaching on farm. Three low-cost practices were then selected for the programme focus. By supporting and formalising these practices and outcomes legitimacy was gained with the majority of farmers by fitting with existing institutional logics. Not all aspects of a second enabling dynamic, *institutional distancing*, were observed in the NZ PEP. *Continuous positive feedback* was given by the PEP coordinator. During the first meeting there were no seating arrangements, which resulted in the researchers and industry partners clustering together in the front of the room and the farmers doing the same at the back of the room. Observing a similar meeting four years on, farmers and researchers felt comfortable sitting at the same table and discussing case studies to enable solutions to on-farm challenges. The PEP coordinator changed the interaction between farmers and researchers by showing previous successes achieved by having multi-actor engagement. Seeing these examples led actors (including all PEP farmers) to believe in the success of these types of programmes. *Cosmopolitanism* was partially observed in the NZ PEP. A number of the experts involved in the PEP were already farm systems experts, who were very aware of on-farm constraints. A smaller group of people came in with a completely new way of thinking, which is essential in supporting change. The third aspect, *structural assurance* was partially provided on an individual-level in the NZ PEP. For example, a number of farmers received labour assistance by planting new crops to reduce nitrate leaching. The assistance contributed to legitimacy and space to implement a new practice from a financial perspective. However, how farmers respond to pressure from peers, due to implementation of practices that do not fit with dominant logics, was not addressed in the programme.

4.8. External feedback loops

We did not observe any external feedback loops amongst the Sc farmers. The Sc PEP was the main governmental policy on reducing the impact of climate change in the agricultural sector, so no other policy functioned as a feedback loop. Furthermore, none of the Sc farmers commented on changes they saw, e.g. weather conditions, due to climate change.

The NZ farmers who participated in our research were all, to differing extent, faced with incoming nitrate leaching regulation. The regulation functioned as an external feedback loop, because all NZ farmers in this study were concerned about being subjected to regulatory enforcement, which motivated them to explore ways to reduce nitrate leaching. However, the uncertainty around when the regulation would be implemented and how progress would be measured, demotivated a minority of NZ farmers from making changes:

“It’s going to take three years for it to be recognised by Overseer.¹ Farmers aren’t going to put [environmental practices] in until we see some benefits in Overseer from putting it in because it is a cost.” – NZ non-PEP interviewee 51

The external feedback loops also influenced external pressures. Although the majority of the NZ farmers often did not observe changes on farm, the local community observed changes in the quality of nearby streams and lakes, linking that back to be caused by farm practices (Legett, 2017). The community then strengthened the external pressure further contributing to the institutional clash.

5. Analysis and discussion

This paper studied the institutional logics Scottish and NZ farmers hold regarding farming, the mechanisms of change shaping a shift in institutional logics and how PEPs as a policy can contribute to this change. To achieve this aim we looked at the development of logics during the last decade, we described the dominant logics currently guiding farming culture in NZ and Scotland, and explored change mechanisms and identified which were caused by PEPs.

The findings show that farmers have been guided by *farming life* and *family* logics, and these logics do not appear to have changed as a result of the institutional clash. As a response to the institutional clash, and supported by the PEP, changes were observed in the *business* and *learning* logics. The practices and beliefs guiding the *business* logic changed but were still steered by the main value of ‘running a profitable business’. The *learning* logic changed from a *linear* logic towards a *multi-actor* logic, but only for PEP farmers.

In the following discussion we firstly discuss the mechanisms underlying the observed change in logics. Then the theoretical implications are discussed and compared with earlier research. Lastly, the practical implications are presented, providing recommendations for PEP and evaluation design.

5.1. Core mechanisms of change

Our findings highlight the importance of multiple and complementary mechanisms to establish change on an individual-level and to amplify to a field-level (see Table 3 for the observed mechanisms of change). Our findings also highlight there is a difference between Sc and NZ farmers in regards to observed mechanisms of change, partially due to the PEPs. Four out of five change mechanisms were identified at an individual-level: *situated improvising*, *network elaboration*, *double loop learning* and *network reorientation*. The latter two were only observed in the NZ PEP and none of the mechanisms was observed amongst the Sc farmers. Although *emotional intensification*, i.e. obtaining an emotional connection with the new practice, was not observed amongst any of the farmers, the combination of the other four mechanisms stimulated a change in NZ PEP farmers’ learning logic towards becoming *multi-actor learners*. The NZ farmers who only experienced two mechanisms, *network elaboration* and *situated improvising*, did not change their learning logic, emphasising the importance of double loop learning and network reorientation in combination with these mechanisms. Our findings support those of Turner et al. (2020), Prager and Creaney (2017), Getz and Warner (2006) and Coutts (2005), that without *network reorientation* change in practices does not move to changes in beliefs and values. Furthermore, participation in the NZ PEP exposed farmers to *double loop learning*, by jointly deciding which practices to implement, and reflecting on the opportunities and constraints of the

¹ Overseer is software developed to support on-farm nutrient management decisions. Overseer is also used by Regional Councils to estimate on-farm nitrate leaching from farm practices. This estimate is used as a reference for regulating farm-level nitrate leaching (<https://www.overseer.org.nz/>).

practices a year later before deciding how to proceed. Indeed we observed evidence of *double loop learning* similar to that from Brown et al., 2016a through *network elaboration* as farmers innovated with new actors, such as researchers. This observation appears to be associated with a new learning logic and a reframing of environmental practices as needed for compliance to ensure business profitability. The latter was also observed as an outcome of *double loop learning* by Brown et al. (2016a).

However, *double loop learning* did not change values underlying the *business logic*, though Inman et al. (2018) suggest that *double loop learning* might have potential to move farmers away from productivist values. While *double loop learning* changes underlying beliefs, triple loop learning is required to change values (Argyris and Schon, 1996; Brown et al., 2016a). To achieve triple loop learning Preston and Stafford-Smith (2009) and Brown et al. (2016a) identify the need to: i) reform networks, which we observed via *network elaboration* and *reorientation*; ii) supportive institutional arrangements, known *enabling dynamics*, but which were not always present in the PEPs; and iii) external (social) pressures for change, known as *external feedback loops*, but again only present in the NZ PEP, not observed amongst Sc farmers. This finding emphasises the importance of multiple mechanisms if wanting to move beyond practice change, by also establishing change in beliefs and values.

We did not observe changes in institutional logics on a field-level. We speculate that this may be due to the incomplete presence of a combination of macro-mechanisms. Firstly, *unobtrusive embedding*, which would have occurred by PEP participants actively sharing their knowledge, was not observed. The PEP monitor farms adopted and demonstrated environmental practices, which according to Pannell et al. (2006) would make adoption more likely to occur in their networks. A possible explanation for the lack of *unobtrusive embedding* is that it builds on *emotional intensification*. The absence of an emotional connection among farmers and research focusing on reducing nitrate leaching may have demotivated actors from actively participating in the practice, which is the key to successful *unobtrusive embedding* via the bottom-up approach of PEPs (Smets et al., 2012). Secondly, in both Scotland and NZ only one sub-mechanism of *amplification* was observed, while for successful *amplification*, *scope expansion*, *increased frequency and regularity*, and *emotional intensification* are required together (Gray et al., 2015). *Emotional intensification* was lacking in both the Scotland and NZ PEPs. We suggest there may be two reasons for this: i) most practices were framed as providing an economic win, which did not create *emotional intensification* around new beliefs and values, but instead connected with the existing business logic beliefs and values; and ii) *emotional intensification* arose due to sustained interactions, which was observed among monitor farmers, experts and researchers, but not with the network or discussion group farmers. The three sub-mechanisms strengthen each other, e.g. *emotional intensification* can create a connection to the new practice (and associated beliefs and values), which then makes it more interesting to discuss with others, leading to adoption of the new practices by other groups of farmers who in turn are connected to other groups (*scope expansion*). Due to an increased scope, there is an increase in *frequency and regularity* as more people are aware of the practices (Gray et al., 2015). However, if *emotional intensification* is not present, actors may not be interested in frequently sharing this knowledge in their networks, and therefore *amplification* did not occur.

In addition to micro- and macro-mechanisms, external feedback loops can function as an extra driver for change (McGuire et al., 2013). The changes proposed are ideally aligned with and encouraged by positive feedback loops, such as aligned policy and advice (Beers et al., 2014; Prager et al., 2016). There were no external feedback loops for the Sc farmers, which might partially explain the lower level of change these farmers made compared to the NZ PEP farmers. In NZ, farmers were facing regulation to reduce nitrate leaching, which functioned as a positive feedback loop to start *situated improvising* and *network elaboration*; both mechanisms that occurred outside the influence of the PEP. However, the new practices were not yet included in the nutrient

management tool Overseer used by Regional Councils to estimate on-farm nitrate leaching from farm practices. The lack of inclusion created a negative, rather than a positive, feedback loop by not recognising the improved environmental outcomes from the new practices. A positive external feedback loop can also come from observed changes in environmental conditions (e.g. Van Herzele et al., 2013). However, effects caused by diffuse pollution, such as emissions of GHGs and nitrate leaching, are not readily observable by farmers, or attributable to individual farms and farming activity (Macgregor and Warren, 2006). The lack of observable change contributes to a disconnect between farmers' practices today and their distant and diffuse impacts on climate change or nitrate leaching (Geoghegan and Leyson, 2012). Therefore, micro-mechanisms, such as *network elaboration* and *reorientation*, are required to provide farmers with new insights, for example regarding the effects of on-farm activities on diffuse pollution, along with other external feedback loops (e.g. recognition of farmers' environmental practices in industry awards). Some farmers in NZ, where their farm was neighbouring a stream or river, mentioned the water quality in this stream as a feedback loop for change. However, most farmers did not observe any changes in environmental outcomes.

In addition to macro-mechanisms, enabling dynamics are required for a change in farming culture on an individual- and field-level. In the NZ PEP enabling dynamics were present, however, perhaps due to the incomplete presence of macro-mechanisms radiation to a field-level did not occur. This lack of radiation leads us to conclude that for practice-level change to diffuse to field-level aligning and combining micro-mechanisms, macro-mechanisms, and enabling dynamics are required.

5.2. Theoretical implications

The farmers who participated in this research were observed to retain values underlying the *business logic* by incorporating environmental compliance within this logic to maintain 'a profitable business'. Previous research suggests that seeing environmental compliance as a factor to maintain a profitable business might stimulate farmers' extrinsic motivation (e.g. adopting environmental practices because of financial reasons), but decreases their intrinsic motivation (wanting to do the 'right thing') (Lokhorst et al., 2011; Van Herzele et al., 2013). This switch in motivation is problematic, because it suggests that there could be a lack of farmer buy-in to comply with environmental regulations, and not stimulate farmers to create more systemic change to achieve environmental outcomes (Burton and Paragahawewa, 2011; McGuire et al., 2013; Pretty, 2003).

Burton and Paragahawewa (2011) suggest that good farmer practices, beliefs and values are determined by the combination of economic (a profitable farm), social (how a farmer is seen by peers) and cultural (knowledge and skills) values. We hypothesise that the PEPs placed less emphasis on changing social and cultural beliefs and values by focusing on motivating farmers to take up 'win-win practices'. However, focusing on only the economic value is likely to be insufficient to establish long-term change. Implementing a new practice, such as a change in crop management, makes the farm look different through, for example, less 'tidy' fields. From a social and cultural perspective, untidy fields might lead peers to place the farmer outside the 'good farming' category. This peer pressure is problematic, because our findings suggest continuous positive feedback from peers and experts is important for scope expansion. Kuhfuss et al. (2016), for example, emphasise the importance of peer influence on the adoption of new practices.

A potential way to address the decrease in social and cultural values is by environmental policies putting more emphasis on creating cultural and social values and thereby reshaping the identity of the 'good farmer'. This reshaping is possible via, for example, rewarding environmentally sustainable farmers for being 'good' farmers by providing certified qualifications through an organisation with high credibility in the field (Burton and Paragahawewa, 2011). The importance of interaction among farmers highlights the need to provide *enabling dynamics*

such as *institutional distancing* (Smets et al., 2012). By creating a new network of peers, farmers might be able to move away from the existing logics and feel more comfortable implementing practices adhering to new beliefs and values.

In line with previous studies we find that there is a need to rethink PEPs by moving away from PEPs for creating practice change to PEPs for stimulating changes in beliefs and values that underpin more enduring practice change (Burton and Paragahawewa, 2011; Inman et al., 2018; Lokhorst et al., 2011; McGuire et al., 2013; Van Herzele et al., 2013). To be able to stimulate a change in farming culture, PEPs need to be framed as operating within a dynamic institutional and organisational environment that they can leverage by: recognising and drawing on positive external feedback loops and institutional clashes to enhance motivation for change (Beers et al., 2014; Klerkx et al., 2010); working on *emotional intensification* and *institutional distancing* to recognise and encourage changes in beliefs and values; and *network reorientation* and *elaboration* to stimulate connections with actors holding beliefs and values that support the practice (Coutts, 2005; Turner et al., 2020; Vereijssen et al., 2017). Hence, instead of conceptualising PEPs as operating from farmers out to others (Wood et al., 2014), we highlight the importance of conceptualising PEPs as being situated within a social network of actors and an institutional environment with aligned and competing institutional logics that are simultaneously supporting and hindering cultural change. PEPs need to then draw on multiple mechanisms to align with actors with shared logics.

Lastly, while our findings focus on the role of PEPs in stimulating changes in farmer beliefs and values, consideration of the influence of enabling dynamics, macro-mechanisms and external feedback loops on these changes (Fig. 3) has implications for how the wider agricultural extension and innovation system (also referred to as the agricultural knowledge and innovation system) is organised to reshape farmer institutional logics. Our findings suggest that coordinating industry, government and research activities in the extension system will be important to sustaining ongoing institutional change beyond a typical extension project lifespan. This involves embedding PEP activities in other extension system changes (Turner et al., 2016). At the organisation level via industry and research organisations providing formal recognition of environmental practices and outcomes (organisational coordination) (Klerkx and Jansen, 2010) and recognition by peers and experts through industry environmental awards (continuous positive feedback). At the network level via extension organisations increasing the frequency of references to the environmental practices and terminology in their extension activities (amplification) (e.g. Cofré-Bravo et al., 2019). At the policy-level providing external feedback loops such as Government regulations that recognise environmental practices (e.g. Turner et al., 2017). Such extension system coordination is, however, challenging in privatised and pluralistic extension systems, such as New Zealand and Scotland (Lamprinoupolou et al., 2014; Turner et al., 2016). As Turner et al. (2016) recommend this requires a system-wide change in the logic of extension itself from a 'linear' to 'multi-actor' logic.

5.3. Practical implications

A complete change in values, beliefs and practices underlying farming culture studied in this paper was not achieved, due to the incomplete presence of micro-mechanisms, macro-mechanisms, enabling dynamics and external feedback loops. A PEP cannot influence the presence of external feedback loops, but its timing can be aligned with, for example, new regulation regarding nitrate leaching or the emission of GHGs. To achieve aligned timing of activities, industries are required to work closely with governments to coordinate action (McGuire et al., 2013; Turner et al., 2017).

A PEP can support change by ensuring the presence of enabling dynamics, micro- and macro-mechanisms. Although both the NZ PEP and Scottish PEP have a deliberation and discussion process to determine

which practices farmers will implement, we suggest a formal management board for each farm, consisting of monitor farmers, experts, and researchers, might be beneficial (Campbell et al., 2006). Such a management board can identify per farm which mechanisms and dynamics are required for that farm specifically and base their tasks on that. For example, by selecting and inviting experts and researchers to meetings, they can monitor the presence of the micro-mechanisms of *network elaboration* and *reorientation*.

Our study has shown that farmers are independently capable of network elaboration, however, to stimulate farmers to become knowledge co-creators instead of just consumers, PEPs have the ability, via *network reorientation*, to place the 'right' actors together to stimulate farmers to actively co-creator knowledge (Prager and Creaney, 2017; Turner et al., 2020). Furthermore, the board can influence the presence of enabling dynamics: by collecting the outcomes of the *situated learning process* to provide *organisational coordination*; by providing *continuous positive feedback* via examples of other successful PEPs and multi-actor collaborations, which facilitators can communicate to the actors in meetings; and by enhancing *cosmopolitanism* by introducing actors who have different logics than the farmers in the project.

A more difficult to achieve enabling dynamic is *structural assurance*. To allow the development of new values, farmers need to have a 'safe' environment in which they can develop these values, without feeling pressure from their peers to conform to the existing dominant logics. This finding is supported by Cofré-Bravo et al. (2019), who state that open networks (achieved by network elaboration and reorientation) are required to explore new knowledge, and closed networks (achieved by creating a safe environment) are required for successfully implementing technologies. One way PEPs can create a safe environment is by establishing a new peer group, consisting of actors interested in developing new practices (Burton and Paragahawewa, 2011). Furthermore, Cra-dock-Henry et al. (2020) highlight that openly exploring multiple pathways, by including ideas from researchers and farmers, contributes to the creation of a 'safe' environment. Again, the organisation, such as the board and the facilitators, behind a PEP can bring these farmers together. More specifically, to ensure the peer group stays together, facilitators play a key role by establishing a long-term relationship with actors in the group. This is needed to establish a process of knowledge co-creation between all actors (Klerkx and Jansen, 2010).

Furthermore, by framing PEPs as initiatives for stimulating changes in beliefs and values that underpin more enduring practice change, a PEP can support macro-mechanisms to ensure radiation on a field-level. *Scope expansion* can be achieved if all actors in a PEP share the findings within their networks, which consequently leads to *increased frequency and regularity* of the new practices and associated values and beliefs. These actors include the farmers participating in the PEP, who can then function as boundary organisations by introducing farmers in their networks to new values, beliefs and practices. *Emotional intensification* is more difficult. Gray et al. (2015) show that emotions enhance when people feel part of a collective, e.g. guilt due to the negative effects of on-farm activities on public goods, such as deteriorating water quality. However, we think that *emotional intensification* should have a positive association, for example PEPs can enhance *emotional intensification* by farm visits during which a farmer can share their story of change and thereby inspire other farmers.

Besides implementing design aspects, knowing which micro- and macro-mechanisms should be present for successful change can contribute to the design of an evaluation framework for policies. When designing a policy, it might be useful to identify which mechanisms are already present amongst farmers as part of an 'ex-ante' evaluation. During the PEP, a regular reflection on which mechanisms of change are absent, whether these mechanisms are required for change, and how PEPs might contribute missing mechanisms, can be conducted to assure optimal PEP (re)design.

Moreover, synchronising PEPs with existing policies might stimulate change. The NZ government for example announced implementation of

nitrate leaching caps for farms at the same time the PEP was initiated. Even though the caps were not yet implemented, the announcement functioned as an external feedback loop for farmers to work towards change. Other policy options at the phase of diffusion to a field level, could be a subsidy. One example is the One Billion Trees initiative in NZ, which for example can be used for riparian planting on farm, which reduces nitrate leaching into streams (New Zealand, Forestry, 2020). Another example is in Turner et al. (2017) where the Regional Council successfully lobbied Central Government to establish the Hill country Erosion Fund to subsidise tree planting on farms to reduce erosion. However, to not undermine internal motivation of farmers (Knook et al., 2020a), other support mechanisms could be made available, such as expert advice financed by the government.

5.4. Limitations and future research

This research has provided insights into change within a culture of farming from a farmer perspective. Although we have taken a holistic approach by collecting the overall values, beliefs and practices of a subset of farmers in Scotland and NZ, we need to acknowledge that the farming population is heterogeneous. Previous research has shown that farmers differ in their decision-making processes (Barnes et al., 2011; Barnes and Toma, 2012; Bewsell et al., 2007; Inman et al., 2018; Knook et al., 2020a) and it is thus important to take this heterogeneity into account when approaching farmers for PEP participation.

Furthermore, this research has allowed the identification of a coherent set of mechanisms that contribute to institutional change. Research on a larger sample of PEPs is required to identify whether the combined presence of these mechanisms indeed leads to institutional change.

As mentioned in the section ‘practical implications’, to enhance *cosmopolitanism* new actors with different logics should be introduced to the PEP. However, research has shown that experts or researchers lose credibility when they do not understand the farm (Ingram, 2008). Further research should focus on the tension between experts understanding the farm, situated within their own conceptualisation of farming culture, and being able to bring in new logics. These topics can be studied by for example looking into the negotiation process among different actors and how these processes lead to change (Osei-Amponsah et al., 2018).

6. Conclusion

This paper studied how Scottish and New Zealand farmers who, facing an institutional clash, changed practices, beliefs and values that constitute their farming culture and how agri-environmental PEPs contributed toward these changes. The findings show that the dominant logics in Scotland and New Zealand are: the *business*, *farming lifestyle*, *family*, and *learning* logics. It is shown that only monitor farmers who are part of a PEP changed some of their beliefs and values, and that the combination of the micro-mechanisms of *situated improvising*, *network elaboration*, *double loop learning* and *network reorientation* are required for this change. The study did not observe changes on a field-level; potentially due to a lack of complementary micro- and macro mechanisms and external feedback loops. The study furthermore shows that PEPs can be useful as an incremental or supportive tool by providing missing enabling dynamics, and micro- and macro-mechanisms needed to achieve change. However, PEPs need to be supported by external feedback loops, such as regulation and observable changes in environmental conditions on-farm. Therefore, timing of these initiatives is crucial for success. Lastly, this study highlights that to achieve environmentally sustainable farming, policies should address the cultural embeddedness of current farm practices.

CRedit authorship contribution statement

Jorie Knook: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Visualization, Data curation, Project administration. **James A. Turner:** Conceptualization, Validation, Writing - review & editing.

Acknowledgements

We are grateful to all the farmers who participated in our study. We also thank our colleagues Ina Pinxterhuis, Robyn Dynes, Cecile de Klein, Martin Espig, Vera Eory, Matthew Brander and Dominic Moran for their support and providing useful suggestions and ideas during the research. Furthermore, this paper was improved by the critical and constructive review by three anonymous reviewers. We thank the programme Forages for Reduced Nitrate Leaching, with principal funding from the New Zealand Ministry of Business, Innovation and Employment and co-funding from research partners DairyNZ, AgResearch, Plant and Food Research, Lincoln University, the Foundation for Arable Research and Manaaki Whenua – Landcare Research. The first author was also partially supported by the Rural and Environment Science and Analytical Services Division of the Scottish Government, and AgResearch Research for Innovation and Impact programme. The second author was funded by the AgResearch SSIF programme AgriSTAR and Our Land and Water National Science Challenge.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jrurstud.2020.06.037>.

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